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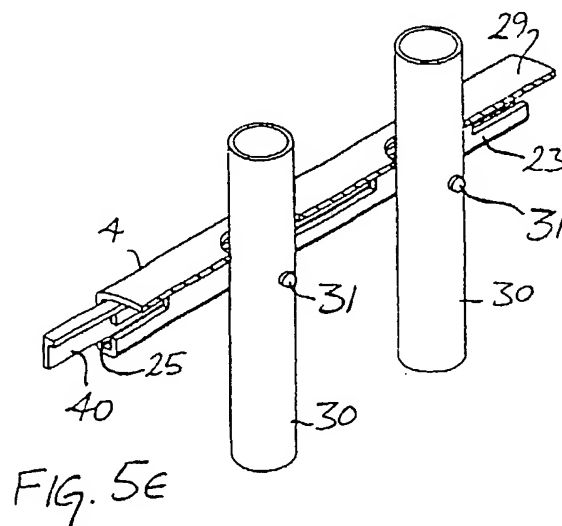
(58) Field of Search

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(54) Abstract Title

Adjustable fence panel and method of assembly

(57) A fence panel comprises a plurality of vertical pales (30) which pass through holes in a pair of rails (4). Pins (31) are fixed near the top and bottom of each pale and retained in recesses in each rail by a locking piece (40) which is inserted into a channel (25) from the end of the rail. The locking piece is conveniently a length of plastic or steel angle and is retained in the rail by end caps which attach the rails to the posts of the fence. A method for assembling a fence panel is also disclosed, comprising inserting the pales into the rails and rotating them to locate the pins in the recesses, then inserting the locking piece into the rail. The pales pivot about the pins, allowing the panel to be adjusted to follow the slope of the ground. The panel may be dismantled by removing the end caps and locking pieces.



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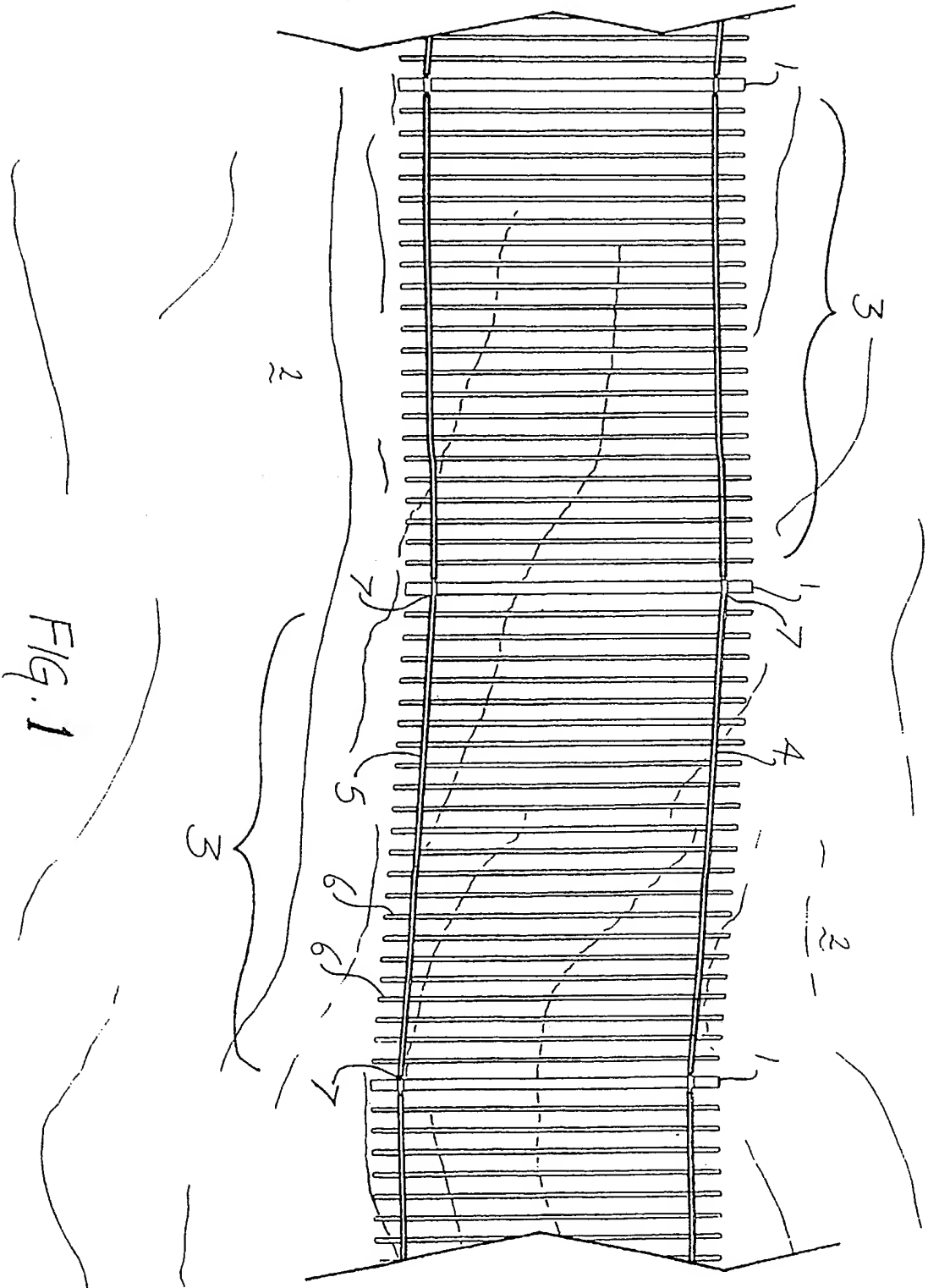
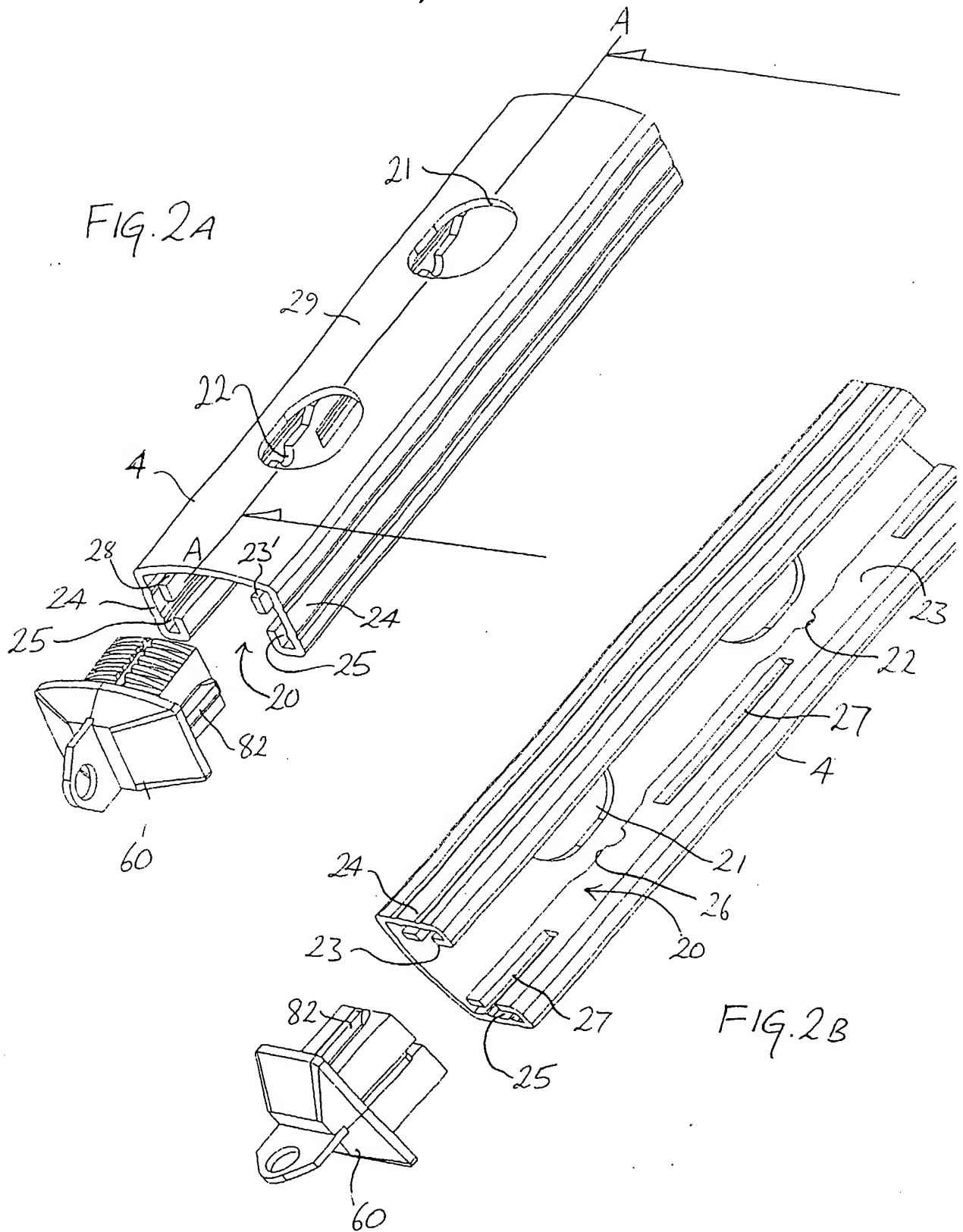


Fig. 1



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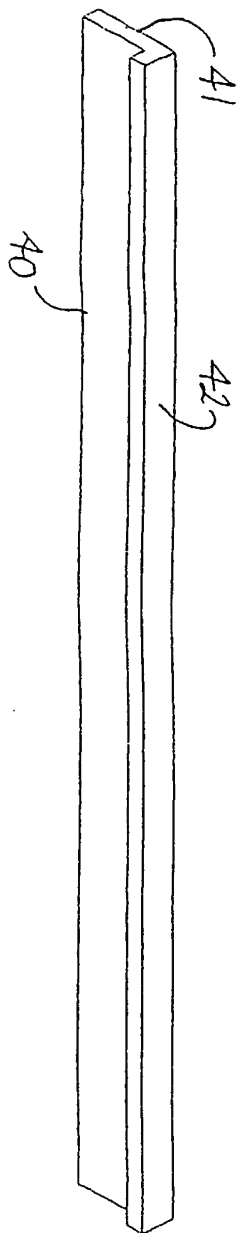


FIG. 4

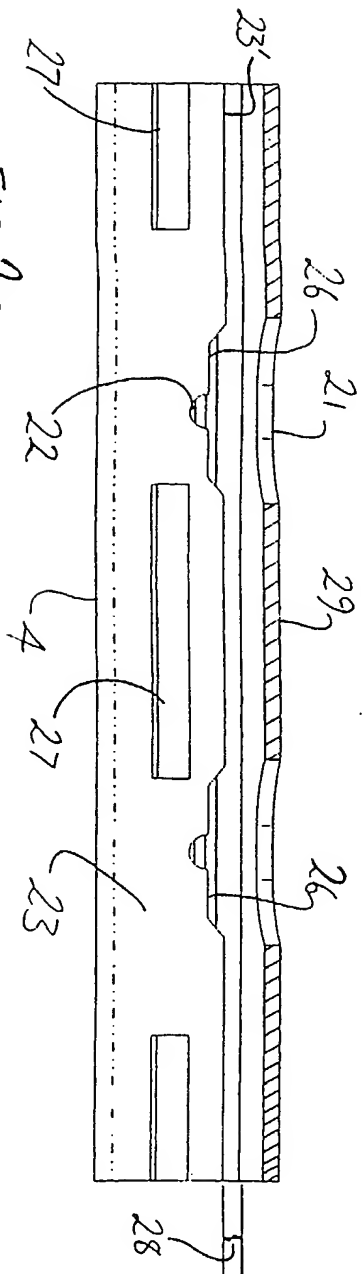


FIG. 2C

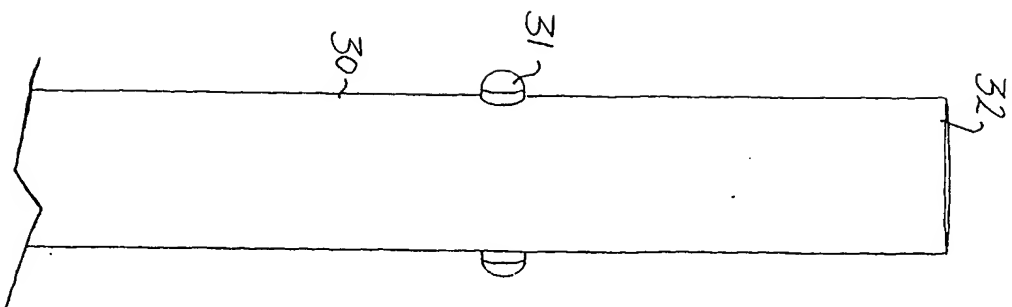


FIG. 3

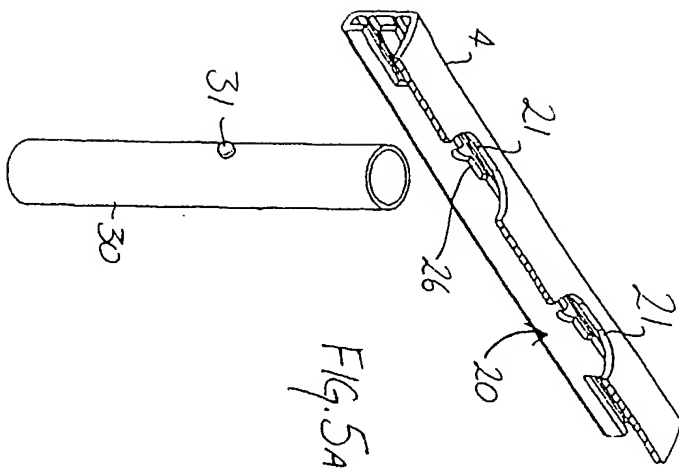


FIG. 5A

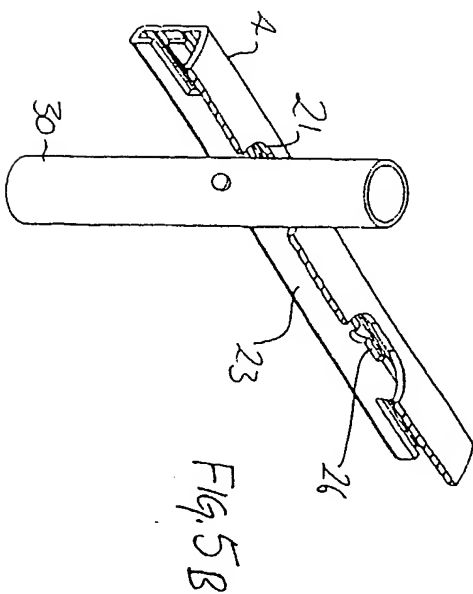


FIG. 5B

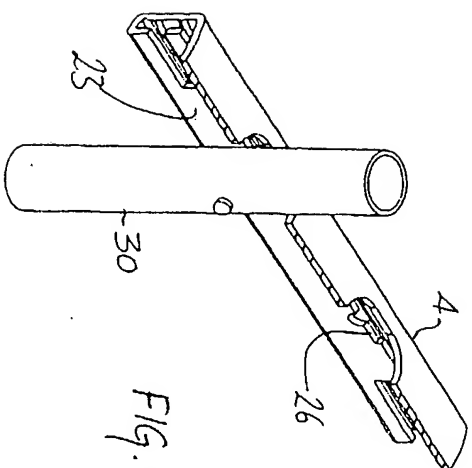


FIG. 5C

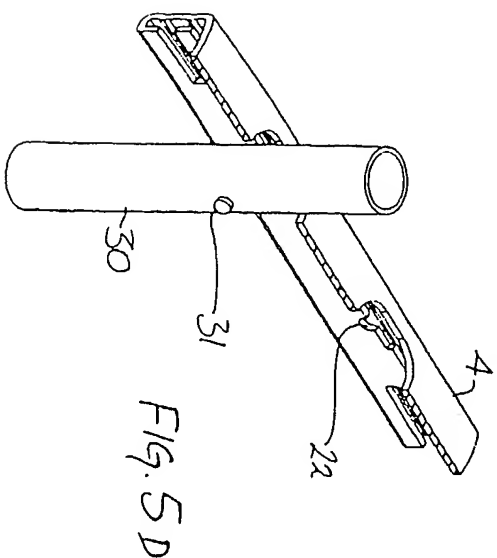


FIG. 5D

Fig. 5e

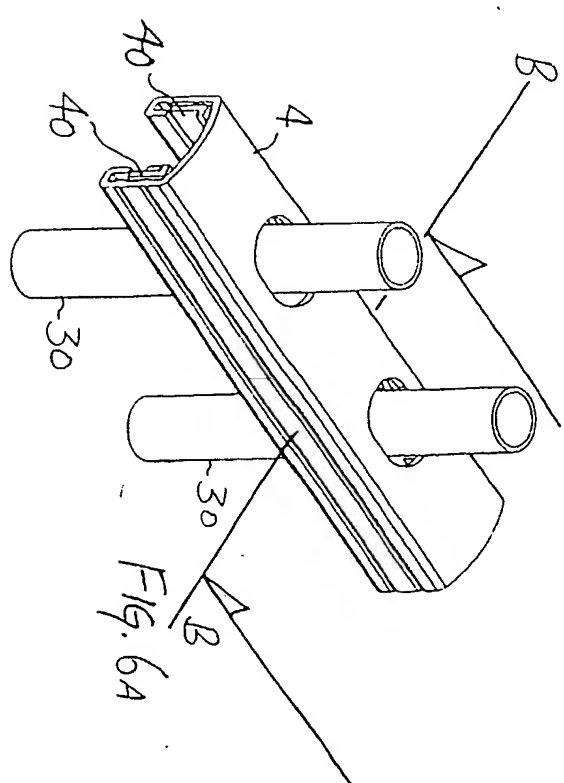
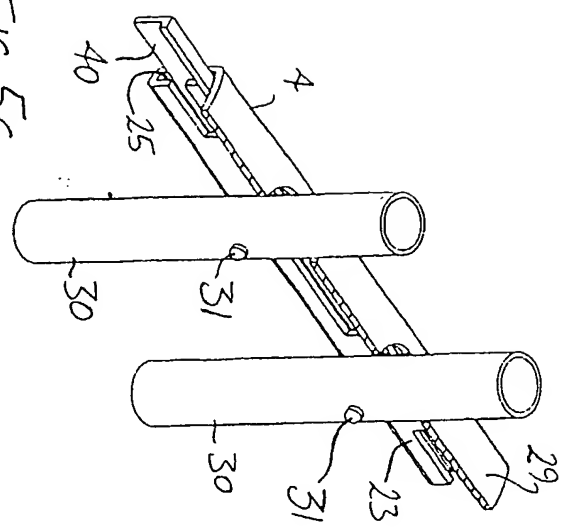


Fig. 6a

Fig. 6b

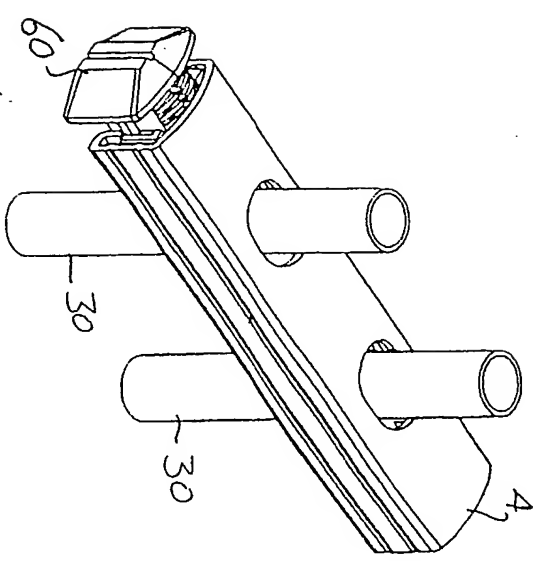
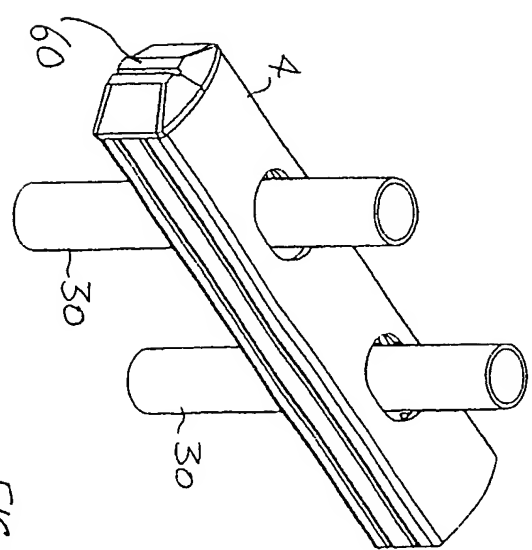
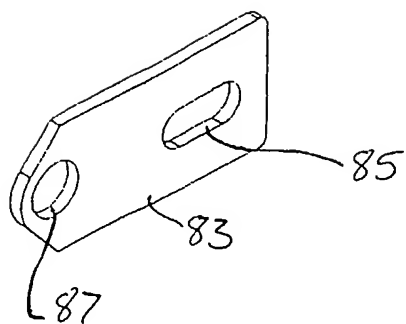
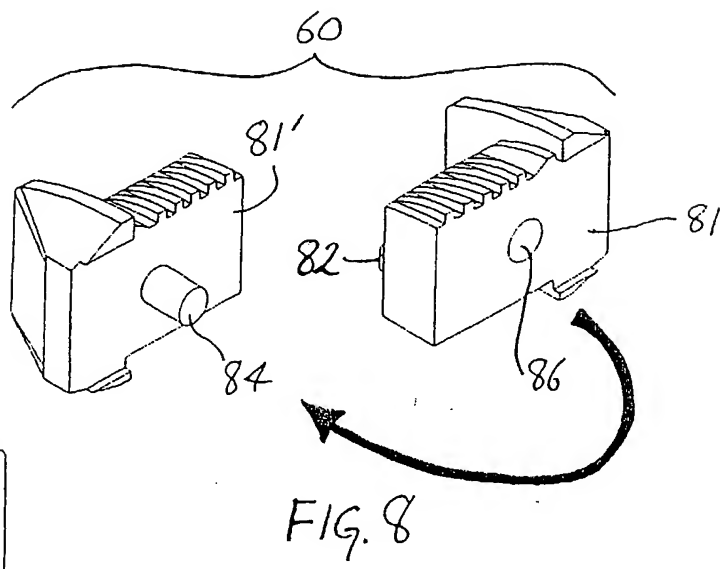
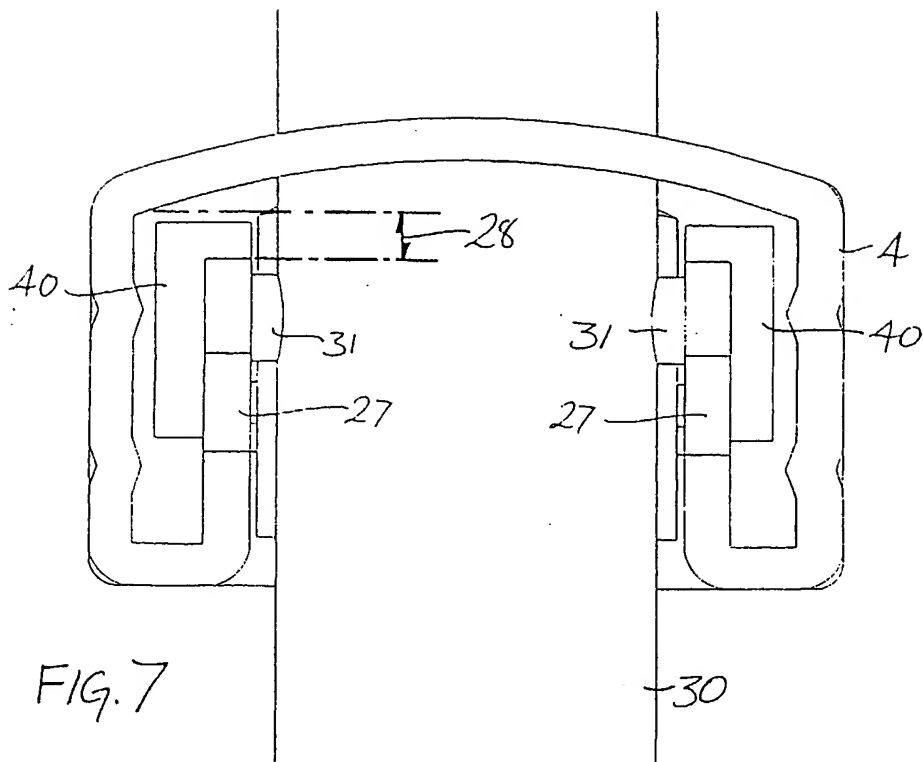


Fig. 6c



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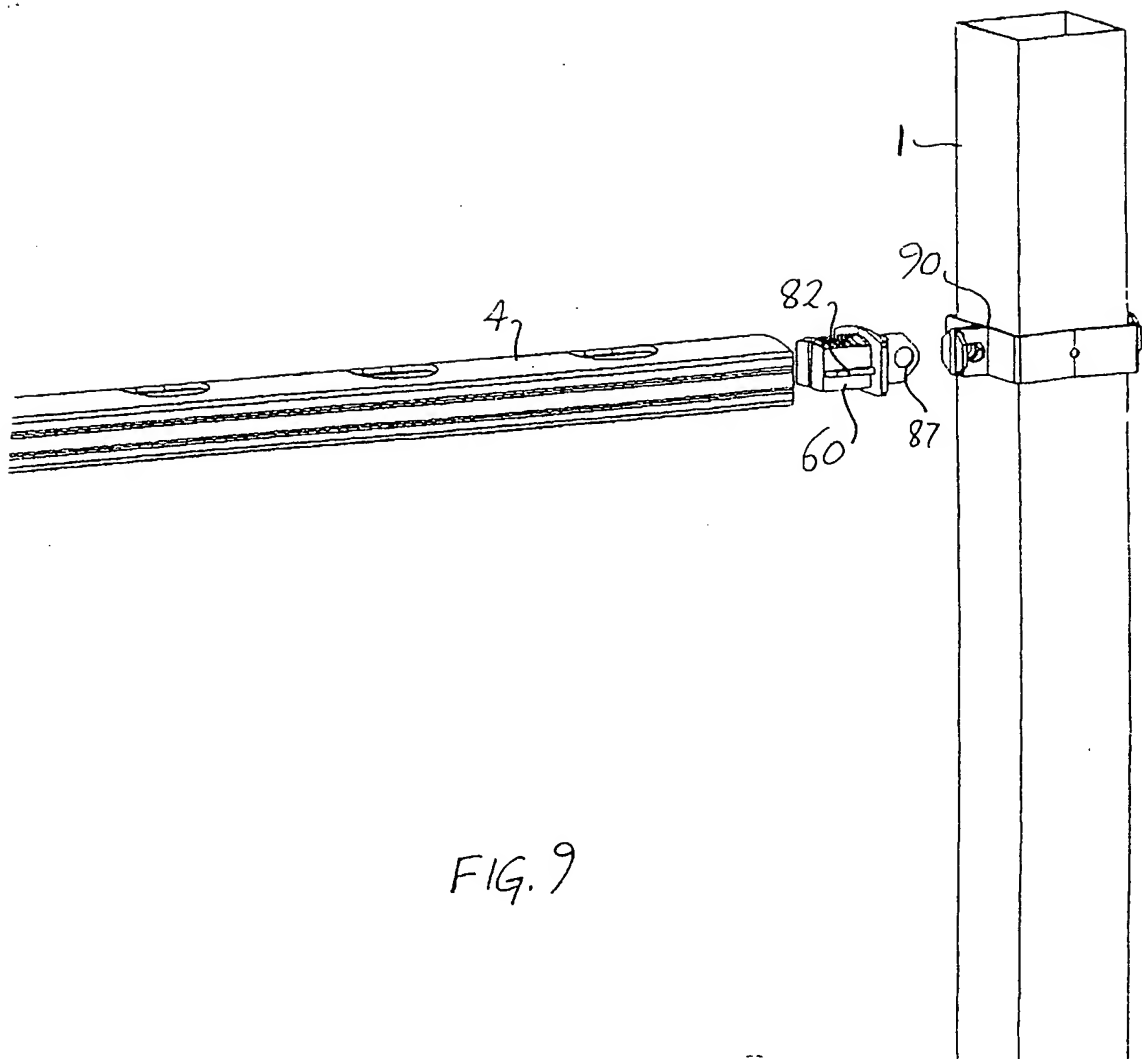


FIG. 9

Adjustable Fence Panel and Method of Assembly

This invention relates to the assembly of fence panels, which may be angled to follow the contours of the ground, from pales and rails.

5

- Fence panels made from pales and rails are well known in the art, and comprise a plurality of parallel vertical pales supported near their top and bottom ends respectively by an upper rail and a lower rail. Intermediate rails may be disposed between the top and bottom rails for additional support. Each pale typically
- 10 comprises a steel tube or bar, and in this specification a pale is taken to be any generally vertical member forming a fence panel. A number of panels may be used to form a fence by sinking a line of upright posts into the ground and attaching each panel at the ends of the rails between adjacent posts.
- 15 Where a fence is erected on sloping ground, it is desirable that each panel should be deformable from a generally rectangular shape to that of a parallelogram. This enables the panel to be adjusted during installation so as to enable it to follow the contour of the ground without leaving gaps underneath. It is known in the art to provide fence panels with a range of angular movement between the pales and rails
- 20 to permit this adjustment during installation. For example, the pales may be attached to the rails by means of rivets about which the pales can pivot. However, this design leaves the rivets vulnerable to attack by an intruder armed with a cold chisel or the like, which may be used to remove one or more pales and thus penetrate the fence.
- 25 EP 1016768 to Garfex discloses a fence comprising tubular pales which are located in recessed rails by fixed and resilient pins, about which the pales may pivot. Each pale is inserted into the rails and then rotated a quarter turn to locate the fixed pins in recesses in one rail; the resilient pins spring into holes in the other rail to lock the pale in position.

This enjoys the advantage that the panel may be transported as a bundle of pales and rails, and assembled on site. However, where resilient fastening pins are employed, the possibility remains that an intruder with suitable tools may force back the pins and thereby disengage the pale from the rail. A further disadvantage is that the pales
5 are difficult to remove without causing damage to the rails. Once assembled on site, a panel cannot then be dismantled if it is no longer required.

It is accordingly the object of the present invention to provide an improved fence panel which allows the convenient and secure assembly of pales and rails.

10

According to the present invention there is provided a fence panel,

comprising at least two substantially horizontal rails and a plurality of substantially
15 vertical pale members arranged therebetween;

each pale member having a lug,

and at least one rail having a plurality of apertures formed therein together with
20 recess means associated with each aperture,

each vertical member passing through an aperture such that the lug engages with the recess means so as to locate the vertical member to the rail;

25 and characterised in that there is further provided a locking piece,

the locking piece cooperating with the recess means so as to secure the lugs therein.

According to the present invention there is further provided a method for assembling a fence panel comprising the steps of:

- 5 a) assembling a plurality of substantially vertical pale members into at least two substantially horizontal rails so that each pale member passes through an aperture in one of the rails;
 - b) rotating each pale member so that a lug on the pale member locates in recess means associated with the aperture in the rail so as to locate the pale member to the
10 rail; and
 - c) inserting a locking piece into the rail so as to secure the lugs in the recess means.
- 15 The fence panel may be easily transported in the dismantled condition then assembled on site to the required size, and the vertical members are securely retained within the rails once assembled.

An illustrative embodiment of the invention will now be described by way of
20 example and with reference to the accompanying drawings in which:

Figure 1 is a perspective view of a fence assembled from panels according to the invention;

25 Figures 2a and 2b are perspective views of the upper rail of one of the panels shown in Figure 1;

Figure 2c is a perspective view of a longitudinal section of the rail along line A – A as shown in Figure 2a;

Figure 3 is a perspective view of the upper part of one vertical member of the fence of Figure 1;

Figure 4 is a perspective view of a locking piece of the fence of Figure 1;

5

Figures 5a – e are perspective views of various stages in the assembly of the vertical member and locking piece into the rail of Figure 2c;

Figures 6a – c are perspective views of further stages of assembly of the same rail;

10

Figure 7 shows a cross section through the assembled rail along line B – B in Figure 6a;

Figure 8 is a perspective view of the component parts of the attachment means of the rail; and

15

Figure 9 is an exploded perspective view of the configuration of the rail, the attachment means and a post of the fence.

20 Referring to Figure 1, a fence comprises a number of upright posts 1 which are erected on sloping ground 2, together with panels 3 which are supported between the posts. Each panel 3 comprises an upper rail 4 and a lower rail 5 which support a plurality of vertical members 6 between them.

25 Some of the panels are angled to follow the slope of the ground, and this is made possible by the rails 4 and 5 which allow the vertical members 6 to pivot within them to a limited degree. The rails are thus aligned with the ground surface whilst the vertical members remain generally vertical and in alignment with the posts. The panels are attached to the posts by attachment means 7, which permit the rails to be
30 angled with respect to the posts.

The upper and lower rails 4 and 5 are identical.

Referring to Figures 2a, b and c there is shown part of the upper rail 4 before
5 assembly into the panel 3. The rail comprises a generally C-shaped steel section
having one open side 20, and a plurality of apertures 21 formed in the opposite side
29. Each of the remaining two sides of the section is folded to form an inner wall 23
and an adjacent outer wall 24, defining a channel 25 therebetween. A gap 28 is
defined between the top 23' of each inner wall 23 and the side 29. Adjacent each
10 aperture is a recess means comprising a semicircular recess 22 which is formed in
the inner wall 23 of the rail. A cutout 26 is formed in each inner wall 23 adjacent
each recess. A number of slots 27 are also formed in each inner wall.

The recess 22 may alternatively be V-shaped.

15

Referring to Figure 3 a vertical member 30 of the fence comprises a steel tube. A
steel pin 31 is fixed through holes in the tube wall across the diameter of the tube, for
example by pressing or welding, so that its ends project outwardly from the tube wall
to form two lugs. The pin 31 is positioned a little way from the upper end 32 of the
20 tube, so that when the pin is engaged in the upper rail 4 as described below, the tube
projects for a short distance above the upper rail. An identical second pin is similarly
attached to the tube near its bottom end, and this second pin similarly engages the
lower rail 5 so that the tube extends for a short distance downwardly from the lower
rail to meet the ground surface when the fence is erected.

25

Referring to Figure 4, a locking piece 40 comprises an angled bar such as a length of
unequal angle, which may be made for example from plastics material or steel, with
a wide side 41 and a narrow side 42.

Referring now to Figures 5a – e, each vertical member 30 is first inserted through the open side 20 of the rail 4 into an aperture 21. Each aperture 21 is elongate in form with its longer axis coaxial with the rail. The longer axis is longer than the pin 31, allowing the vertical member to be inserted through both the upper rail 4 and the lower rail 5 so that the pin 31 and the identical second pin are located respectively within the upper and lower rails.

The vertical member 30 is then rotated (5b, 5c) through 90° so that each end of the pin 31 locates within a cutout 26 in an inner wall 23 of the rail. The shorter axis of each aperture 21 is orthogonal to the main axis of the rail and approximately equal to the distance between the inner walls 23, and is slightly longer than the outside diameter of the vertical member 30. The vertical member 30 thus fits snugly between the inner walls and within the shorter axis of the aperture 21, but with enough clearance along the longer axis of the aperture to enable it to pivot longitudinally with respect to the rail, as described below.

The vertical member is then dropped (5d) into position so that the ends of the pin 31 locate in the semicircular recesses 22. The upper surface of each end of the pin is then level with the top 23' of the inner wall 23 of the rail 4. The identical second pin is similarly located in the lower rail 5.

When all the vertical members 30 have been assembled into the rails, a locking piece 40 is inserted from the end of the rail into the channel 25. The narrow side 42 of the locking piece occupies the gap 28 between the top 23' of each inner wall 23 and the side 29, and abuts against the upper surface of the ends of the pins 31. The locking piece thus prevents each pin 31 from being lifted out of the recess 22. This in turn prevents the vertical member 30 from being rotated and removed from the rails.

A locking piece 40 may be inserted into one or both channels 25 in one or both rails 4 and 5.

Referring to Figures 6a and 7, the rail is shown with the vertical members 30 and both locking pieces 40 in position.

- 5 Referring to Figures 6b and 6c, an end cap 60 is then inserted into each end of each rail to retain the locking pieces 40 in the rail, preventing their removal whilst the end caps 60 are in position.

- 10 Referring to Figures 8 and 9, the end cap 60 comprises two halves 81 and 81', which may be moulded from metal or suitable plastics material and are retained together by the rail into which the end cap 60 is inserted. Flanges 82 are provided on each half and locate in the slots 27 in the inner walls 23 of the rail; this is more clearly seen in Figures 2a and 2b. Slots 27 are provided between each pair of apertures 21, enabling the rails 4 and 5 to be cut to any required length. Each panel of the fence may
15 therefore be manufactured on site to the length required.

- Returning to Figures 8 and 9, a steel plate 83 is placed between the two halves of the end cap 60, and retained by a dowel 84 on one half 81' of the end cap. The dowel 84 passes through a hole 85 in the plate and locates in a corresponding hole 86 in the
20 other half 81. A hole 87 is provided in one end of the plate 83 which projects from the end cap, the plate 83 and end cap 60 together forming attachment means for attaching the rail to a post 1 of the fence.

- Referring to Figure 9 the post 1 is provided with a bracket 90 which receives the
25 projecting end of the plate 83, for example by bolting through the hole 87 using a suitable security fastener. A similar bracket is provided near the base of the post for securing the lower rail 5. The plate 83 is able to pivot within the bracket allowing the rails 4 and 5 to be angled to follow the slope of the ground.

Once the panel is attached to the fence posts 1 it is impossible to remove the locking pieces 40 from the rails without first detaching the end caps 60 from the posts.

However, once removed from the posts, the panel no longer contributes to the security of the fence, and may then be dismantled by the simple procedure of

5 removing the end caps 60 and locking pieces 40, then rotating and removing each vertical member 30. The fence thus benefits from the additional advantage that each panel is fully dismantlable once removed from the fence, but each vertical member remains fully secure whilst the panel is in position. The dismantlable capability of the fence therefore does not compromise its integrity in use.

10

Means may be provided for retaining the end caps in the rails.

CLAIMS

1. A fence panel,
 - 5 comprising at least two substantially horizontal rails and a plurality of substantially vertical pale members arranged therebetween;
 - each pale member having a lug,
 - 10 and at least one rail having a plurality of apertures formed therein together with recess means associated with each aperture,
 - each vertical member passing through an aperture such that the lug engages with the recess means so as to locate the vertical member to the rail;
 - 15 and characterised in that there is further provided a locking piece,
 - the locking piece cooperating with the recess means so as to secure the lugs therein.
- 20 2. A fence panel according to Claim 1, characterised in that each pale member is rotated so as to engage the lug in the recess means.
3. A fence panel according to any preceding claim, characterised in that the rail is provided with a channel, the locking piece being inserted into the channel from one
25 end of the rail so as to secure each lug in the recess means.
4. A fence panel according to any preceding claim, characterised in that there is further provided attachment means for attaching the rails to posts so as to form a fence, the attachment means preventing the removal of the locking piece from the
30 rail.

5. A fence panel according to any preceding claim, characterised in that each lug comprises a projecting end of a straight pin which passes orthogonally through the centre of the pale member, the other end of the pin forming a second lug, and the rail is provided with recess means engaging with both lugs on each pale member.

6. A fence panel according to any preceding claim, characterised in that the pale members may pivot about the lugs.

7. A fence panel according to any preceding claim, characterised in that the rail is provided with two channels, a locking piece being inserted respectively in each channel.

8. A fence panel according to any preceding claim, characterised in that the rail is of generally C-shaped section having one open side, the apertures being formed opposite the open side.

9. A fence panel according to any preceding claim, characterised in that each rail is identical, and each pale member is provided with lugs which engage the recess means respectively in each rail.

10. A fence panel according to any preceding claim, characterised in that each locking piece is elongate.

11. A fence panel according to claim 10, characterised in that each locking piece comprises an angled bar.

12. A method for assembling a fence panel comprising the steps of:

a) assembling a plurality of substantially vertical pale members into at least two substantially horizontal rails so that each pale member passes through an aperture in one of the rails;

5 b) rotating each pale member so that a lug on the pale member locates in recess means associated with the aperture in the rail so as to locate the pale member to the rail; and

c) inserting a locking piece into the rail so as to secure the lugs in the recess means.

10

13. A fence panel substantially as herein described with reference to the accompanying description and drawings.

14. A method for assembling a fence panel substantially as herein described with
15 reference to the accompanying description and drawings.

15. Any novel and inventive feature or combination of features specifically disclosed herein within the meaning of Article 4H of the International Convention (Paris Convention).

20

